CLAIMS

1. A fuel cell system comprising:

a main fuel cell stack that an anode and a cathode are arranged in a state that an electrolyte membrane is interposed therebetween;

a fuel supplying unit connected with the anode of the main fuel cell stack by a fuel supplying line for supplying hydrogen-including fuel to the anode;

an air supplying unit connected to the cathode of the main fuel cell stack by an air supplying line for supplying oxygen-including air to the cathode; and

a sub fuel cell stack for using hydrogen generated at the anode during reaction as fuel.

2. The fuel cell system of claim 1 further comprising:

a gas/liquid separator for obtaining hydrogen generated at the main fuel cell stack after reaction; and

a recycling line connected between the gas/liquid separator and the fuel supplying unit for recollecting fuel exhausted from the gas/liquid separator into a fuel tank.

3. The fuel cell system of claim 1, wherein fuel stored in the fuel tank is aqueous solution of $NaBH_4$.

4. The fuel cell system of claim 2, wherein the sub fuel cell stack is a polymer electrolyte membrane fuel cell (PEMFC).

5. The fuel cell system of claim 4, wherein the sub fuel cell stack is constituted in accordance with that a cathode to which oxygen including air is supplied from the air supplying unit and an anode to which hydrogen generated at the anode of the main fuel cell stack after reaction are stacked in a state that an electrolyte membrane is interposed therebetween.

6. A fuel cell system comprising:

a main fuel cell stack that an anode and a cathode are arranged in a state that an electrolyte membrane is interposed therebetween;

a fuel supplying unit connected with the anode of the main fuel cell stack by a fuel supplying line for supplying hydrogen-including fuel to the anode;

an air supplying unit connected to the cathode of the main fuel cell stack by an air supplying line for supplying oxygen-including air to the cathode;

a heating unit installed between the fuel supplying line and the air supplying line for heating fuel and air supplied to the main fuel cell stack by using hydrogen generated at the anode after reaction as a heating; and

a sub fuel cell stack for using hydrogen generated at the anode during reaction as fuel.

7. The fuel cell system of claim 6 further comprising:

a gas/liquid separator for obtaining hydrogen generated at the main fuel cell stack after reaction; and

a recycling line connected between the gas/liquid separator and the fuel supplying unit for recollecting fuel exhausted from the gas/liquid separator into a fuel tank.

8. The fuel cell system of claim 7, wherein an open/close valve for selectively opening either a flow channel connecting the heating unit and the gas/liquid separator or a flow channel connecting the sub fuel cell stack and the gas/liquid separator is installed between said two flow channels.

9. The fuel cell system of claim 8 further comprising a controller for maintaining a temperature of the heating unit as a proper level by controlling a hydrogen amount supplied to the sub fuel cell stack and for controlling an opening degree of an open/close valve in order to supply hydrogen to the sub fuel cell stack.

10. The fuel cell system of claim 9, wherein the controller controls an opening degree of the open/close valve according to an electric signal applied from a temperature sensor installed at the heating unit for detecting a temperature of the heating unit.

11. The fuel cell system of claim 10, wherein the temperature

sensor is installed at one of a heat generating part, a fuel pipe, and an air pipe of the heating unit.

12. The fuel cell system of claim 9, wherein the controller controls an opening degree of the open/close valve according to an output of the sub fuel cell stack.

13. The fuel cell system of claim 9, wherein the controller controls an opening degree of the open/close valve according to an electric signal applied from a flow amount sensor installed at the hydrogen exhausting line for detecting a hydrogen amount and the temperature sensor installed at the heating unit for detecting a temperature of the heating unit.

14. The fuel cell system of claim 7, wherein the heating unit comprises:

a housing to which a fuel pipe for passing fuel supplied to the anode of the main fuel cell stack and an air pipe for passing air supplied to the cathode are respectively mounted;

a blast fan installed at the housing for blowing external air to inside of the housing; and

a combustor at inside of which a catalyst is mounted and to which oxygen including air blown by the blast fan and hydrogen exhausted from the gas/liquid separator are respectively introduced.

15. The fuel cell system of claim 6, wherein fuel stored in the fuel tank is aqueous solution of $NaBH_4$.

16. The fuel cell system of claim 6, wherein the sub fuel cell stack is a polymer electrolyte membrane fuel cell (PEMFC).

17. The fuel cell system of claim 7, wherein the sub fuel cell stack is constituted in accordance with that a cathode to which oxygen including air is supplied from the air supplying unit and an anode to which hydrogen exhausted from the gas/liquid separator are stacked in a state that an electrolyte membrane is positioned therebetween.

18. A control method of a fuel cell system comprising:

a first step of generating hydrogen from an anode of a main fuel cell stack after reaction;

a second step of supplying hydrogen exhausted from the anode to a sub fuel cell stack; and

a third step of controlling a hydrogen amount supplied to the sub fuel cell stack.

19. The method of claim 18, wherein a controller controls an opening degree of an open/close valve thus to control a hydrogen amount supplied to the sub fuel cell stack when an electric signal is applied from a flow amount sensor which detects a hydrogen amount exhausted from a

gas/liquid separator to the controller in the third step.

20. A control method of a fuel cell system comprising:

a first step of generating hydrogen from an anode of a main fuel cell stack after reaction;

a second step of supplying hydrogen exhausted from the anode to a heating unit and a sub fuel cell stack; and

a third step of controlling a hydrogen amount supplied to the heating unit and the sub fuel cell stack according to a temperature of the heating unit.

21. The method of claim 20, wherein a controller compares a temperature of the heating unit with a set temperature thus to control an opening degree of an open/close valve when a temperature sensor installed at the heating unit detects one temperature of fuel, air, and catalyst thus to apply to the controller in the third step.

22. The method of claim 20, wherein the third step comprises the steps of:

shielding hydrogen supply to the heating unit and supplying hydrogen to the sub fuel cell stack when a temperature of the heating unit is higher than a set temperature β; and

shielding hydrogen supply to the sub fuel cell stack and supplying hydrogen to the heating unit when the temperature of the heating unit is lower than a set temperature α at the time of comparison between the temperature

of the heating unit and the set temperature α in the above step.

23. The method of claim 20, wherein the third step comprises the steps of:

shielding hydrogen supply to the heating unit and supplying hydrogen to the sub fuel cell stack when a temperature of the heating unit is higher than a set temperature β; and

continuously supplying hydrogen to the sub fuel cell stack and supplying hydrogen to the heating unit when the temperature of the heating unit is lower than a set temperature α at the time of comparison between the temperature of the heating unit and the set temperature α in the above step.

24. A control method of a fuel cell system comprising:

a first step of generating hydrogen from an anode of a main fuel cell stack after reaction;

a second step of supplying hydrogen exhausted from the anode to a heating unit and a sub fuel cell stack; and

a third step of controlling a hydrogen amount supplied to the heating unit and the sub fuel cell stack according to a current amount outputted from the sub fuel cell stack.

25. The method of claim 24, wherein the controller controls an opening degree of an open/close valve by comparing a current amount outputted form the sub fuel cell stack with a set value.

26. A control method of a fuel cell system comprising:

a first step of generating hydrogen from an anode of a main fuel cell stack after reaction;

a second step of supplying hydrogen exhausted from the anode to a heating unit and a sub fuel cell stack; and

a third step of controlling a hydrogen amount supplied to the heating unit and the sub fuel cell stack according to a temperature of the heating unit and a hydrogen amount exhausted from the anode.

27. The method of claim 26, wherein a controller controls an opening degree of an open/close valve by judging a hydrogen amount exhausted from a gas/liquid separator according to an electric signal applied from a flow amount sensor thus to control a hydrogen amount supplied to the heating unit and the sub fuel cell stack when the flow amount sensor detects a hydrogen amount exhausted from the gas/liquid separator thus to apply to the controller in the third step.